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Patent Application Transmittal
(only for new nonprovisional applications under 37 C.F.R. 1.53(b))

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Date: November 9, 2000
Attorney Docket No.: DT-3734

ASSISTANT COMMISSIONER FOR PATENTS
Box Patent Application
Washington, D.C. 20231

Sir:

With reference to the filing in the United States Patent and Trademark Office of an application for patent in the name(s) of: **Horst Grafe, Jürgen Merz**

entitled: **HIGH-SPEED SHEAR FOR TRANSVERSE CUTTING OF A ROLLED STRIP**

X New Application
___ Continuing Application

___ Continuation ___ Divisional ___ Continuation-in-Part (CIP)
of prior application serial no. ___, filed ___.

[Note: If priority under 35 U.S.C. 120 involves a series of respectively copending applications, then in this amendment identify each and its relationship to its immediate predecessor.]

___ The prior application is assigned of record to ___.

___ This is an application of a small entity under 37 CFR 1.9(f) and the amounts shown in parentheses below have been employed in calculating the fee:

___ Small Entity Verified Statement(s) is (are) enclosed.
___ Small Entity Verified Statement(s) filed in prior application, status still proper and desired

Patent Application Transmittal

(only for new nonprovisional applications under 37 C.F.R. 1.53(b))

The following are enclosed:

- ☒ Specification (12 pages) & Abstract
☒ 3 Sheet(s) of Drawings
☒ 9 Claim(s) (including 3 independent claim(s))
☐ This application contains a multiple dependent claim
☒ Information Disclosure Statement, PTO-1449 and 3 references;

- ☒ This filing fee has been calculated on the basis of the claims as amended by any enclosed preliminary amendment as follows:

Basic Fee, \$710.00 (\$355.00).....	\$ 710.00
Number of Claims in excess of 20 at \$18.00 (\$9.00) each:.....	00.00
Number of Independent Claims in excess of 3 at \$80.00 (\$40.00) each:.....	00.00
Multiple Dependent Claim Fee at \$270.00 (\$135.00).....	00.00
Assignment Recording Fee \$40.00	00.00
Total Filing Fee.....	\$ 710.00

- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication and credit any overpayment to Deposit Account No. 50-0955. A duplicate copy of this sheet is enclosed

- (x) Any additional filing fees required under 37 CRF 1.16
(x) Any patent application processing fees under 37 CRF 1.17.

- ☒ Oath or Declaration and Power of Attorney
☒ New ☐ signed ☒ unsigned
☐ Copy from a prior application (37 C.F.R. 1.63(d))

Deletion of Inventors

☐ Signed Statement attached deleting inventor(s) named in the prior application (37 C.F.R. 1.63(d)(2) and 1.33(b))

☐ Power of attorney and/or correspondence address was changed during prosecution of the prior application. The new power of attorney is to Reg. No. . The new correspondence address is indicated above.

☐ Incorporation by Reference (for continuation or divisional application)

The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

☐ A Preliminary Amendment is enclosed.

(Claims added by this amendment have been properly numbered consecutively beginning with the number next following the highest numbered original claim in the prior application.)

Patent Application Transmittal

(only for new nonprovisional applications under 37 C.F.R. 1.53(b))

- ☐ Cancel in this application original claims ____ of the prior application before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)
- ☒ New formal drawings are enclosed.
- ☐ Certified copy of each foreign priority application on which the claim for priority under 35 U.S.C. 119 is based was filed in prior U.S. application serial no. , filed . A list of said foreign priority application(s) is (are) provided below. Acknowledgement thereof is requested.

Application No.

Filed

In

- ☒ The Commissioner is hereby authorized to charge payment of the following fees during the pendency of the application or credit any overpayment to Deposit Account No. 50-0955. A duplicate copy of this sheet is enclosed

- (X) Any patent application processing fees under 37 CFR 1.17
- (X) Any filing fees required under 37 CFR 1.16 for the presentation of extra claims.

Respectfully submitted,

Attorneys for Applicant(s)

By: Alexander Zinchuk
Alexander Zinchuk
Reg # 30,541

DT-3734

**HIGH-SPEED SHEAR FOR TRANSVERSE
CUTTING OF A ROLLED STRIP**

NYLIB1/758988/1

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a high-speed shear for transverse cutting of a rolled strip to a length and including a first upper blade drum having a comparatively large diameter and carrying a first blade, a second lower blade drum having a comparatively small diameter and carrying a second blade, and a drive transmission for rotationally connecting the first and second blade drums, with the first and second blade cooperating with each other in a predetermined cutting position of the first and second blade drums for cutting the rolled strip.

2. Description of the Prior Art

Generally, high-speed shears for transverse cutting a rolled strip to a length are well known. Thus, German Publication DE 197 46 528A discloses a high-speed shear having two drums one of which carries a chisel cutter and the other of which carries an anvil that cooperates with the chisel cutter for cutting the strip. A controlled adjusting device displaces the two drums toward each other for cutting a run-through strip. The synchronization of the displacement

of the two drums is effected by using electrical, electronic, and mechanical means.

European Publication EP 0 904 877A2 discloses a high-speed shear with blade drums the diameters and speeds of which differ only insignificantly, and which are driven by an external divider mechanism. The drums are brought into a cutting position, in which the blades are located opposite each other, by a lever-operated setting mechanism and, after cutting the strip, the drums are moved away from each other.

German Publication DE-OS 26 54 866 discloses a flying shear with blade drums rotationally connected with each other. The disclosed shear has a drum rotating device with a force transmitting mechanism that connects the two drums and insures that their speeds are synchronized with the running speed of the fed material. This German Publication further discloses a drum adjusting device for displacing the drums between an open position and a cutting position, and a control unit for controlling the motor of the adjusting device and which controls the displacement of the drums between the open and cutting position.

In the shear disclosed in DE-OS 26 54 866 the ratio of the diameters of the first and second drums is equal 2 to 3, and their rotation is so coordinated that the second drum performs two revolution per three revolution of the first drum. The drum setting or adjusting device is so controlled that the first and second drums are in the cutting position after six revolutions of the first drum and four revolution of the second drum.

As it follows from the disclosure of DE-OS 26 54 866, in particular Fig. 2, the force transmitting mechanism, which connects the drums, the drum adjusting device, and the control unit are very complicated and are failure-prone. The force transmitting mechanism has five tooth gears engaging each other so that the accumulated tooth backlash results in deviation of the angular positions of the blade drums for predetermined positions which can lead to the damage of the shear and also result in an unclean cut.

Accordingly, an object of the present invention is to provide a high-speed shear for cutting hot and/or cold strips which would insure obtaining of a precise cut with the strip being transported with a high speed.

Another object of the present invention is to provide a high-speed shear for cutting hot and/or cold strips which would insure obtaining of a precise cut of strips having minimal thicknesses and transported with high-speeds.

A further object of the present invention is to provide a high-speed shear having a simple structure and non-complicated mechanical and/or electronic mechanisms.

A still further object of the present invention is to provide a high-speed shear in which the danger of the blades or even entire shear being damaged is eliminated.

Yet another object of the present invention is to provide a high-speed shear having reduced mounting and maintenance costs.

SUMMARY OF THE INVENTION

These and other objects of the present invention, which will become apparent hereinafter, are achieved by providing in a high-speed shear of the type described above:

(i) means located in front of and behind the first and second drums for advancing the rolled strips, under longitudinal tensioning, through a gap between the first and second drums, and

(ii) roller means for supporting the tensioned strip and providing for lifting of the strip before passing of the second blade and for lowering the strip before passing of the first blade.

In the shear according to the present invention, the drums can be accelerated to the strip advancing speed by an increase of their rotational speed. This is indispensable at large strip speeds, e.g., of order of 20 m/sec and more.

The novel features of the present invention, which are considered as characteristic for the invention, are set forth in the appended claims. The invention itself, however, both as to its construction and its mode of operation, together with additional advantages and objects thereof, will be best understood from the following detailed description of preferred embodiments, when read with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings show:

- Fig. 1 a schematic view of a high-speed shear according to the present invention;
- Fig. 2 a side view of a shear drum pair in different angular positions during their rotational movement;
- Fig. 3a a front, partially cross-sectional view of a shear blade drum; and
- Fig. 3b a side view of the drum pair according to Fig 3a.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A high-speed shear according to the present invention for transverse cutting a rolled strip to a length, a schematic view of which is shown in Fig. 1, has a first blade drum 1 having a comparatively large diameter, and a second blade drum 2 having a comparatively small diameter. The first and second blade drums 1 and 2 are rotationally connected by a gear transmission (not shown) so that a number of X-revolutions of the first blade drum 1 corresponds to a number of Y-revolutions of the second blade drum 2, whereby the first and

second blade drums 1 and 2 are brought into a cutting position after different but finite numbers of X-revolutions and Y-revolutions, respectively.

According to the invention, the blade drums 1 and 2 are fixedly secured in respective bearing supports in a shear frame 3. The shear further includes pinch-roller sets 4, 5, which are arranged in front and behind the blade drum pair 1 and 2 for advancing the strip 10, under longitudinal tensioning, through a gap between the first and second blade drums 1 and 2. The shear also has support rollers 6, 6' for supporting the strip 10 during its advance. The support rollers 6, 6' lift the strip 10 before the lower blade 7 (Fig. 3b) passes and lowers the strip 10 when the upper blade 8 passes through the cutting position.

The foregoing measures insure in a simple manner that during an "idle run" of the upper, first blade drum 1 and the lower, second blade drum 2, corresponding blades 7 and 8 do not contact the strip 10. To this end, there is provided a corresponding electrical, electronic, or mechanical repeating and synchronization device for displacing the support rollers to 6, 6' to effect lifting or lowering of the strip 10.

According to an embodiment of the present invention, which is shown in Fig. 3a, the first and second blade drums 1 and 2 are fixedly connected with synchronization tooth gears 9, 11, respectively, having respective diameters roughly corresponding to the blade diameters 12, 13 of respective blades 7, 8. The synchronization gears 9, 11 engage each other backlash-free.

Obviously, as *per se* known, the first and second blade drums 1, 2 can be connected with respective drive shafts by a transmission (not shown) which would provide a different transmission ratio than the synchronization gears 9, 11.

The upper, first blade drum 1, on which the blade 8 is mounted, is noticeably flattened at the periphery opposite the blade diameter 12. Therefore, the shear can be brought into a position in which a large opening or gap is formed between the drum 1 and the upper edge of the roll table along which the strip 10 is advanced. A large opening is needed, during entering and passing through of the strip head, as the strip head, for bending up of the front end, is inclined, in a manner of a ski, and with a smaller gap, the strip can be damaged in the region of the shear.

In order to reliably prevent such a possibility, the upper drum 1 is replaced with a blade beam support 1' having the same blade diameter 12. The blade beam support 1' is formed as a beam bridge 16 with two opposite shaft stubs 15, 15', as shown in Fig 3a.

There is further provided *per se* known, hydraulic or mechanical drive or adjusting means for displacing the support rollers 6, 6' and the operation of which is synchronized with passing of the upper and lower blades 8, 7 through the blade gap between the drums 1 and 2. This means insures upward and downward displacement of the support rollers 6, 6' together with the tensioned strip 10 supported thereon. Due to the elevated arrangement of the support rollers 6, 6' which can be seen in Fig. 1, the strip 10 is supported thereon under a compressive strain, which insures that the strip 10 can follow the support rollers 6, 6', during the downward movement of the support rollers 6, 6' without any problem.

According to a further advantageous embodiment of the inventive shear, instead of the blades 7, 8, there are provided, preferably a cutting bit on the upper drum 1 and an anvil on the lower drum 2. The advantage of providing a cutter bit and an anvil consists in that the tolerances in the relative angular

positions of the cutter bit and the anvil do not adversely affect the quality of the cut, and a clean and burr-free cut is obtained.

According to the present invention, the drums 1 and 2 are rotationally preloaded with respect to each other and/or the tooth backlash of the gears 9, 10 is minimized and/or compensated. E.g., the tooth gear 9, which is formed as a pinion, can be radially divided, and respective portions can be rotationally preloaded relative to each other in order to compensate the tooth backlash.

Fig. 2 shows different phases of positions of the blade supports 1', 2, which rotate with different speeds, relative to each other. Only once, they occupy a cutting position, which is determined by a transmission ratio defined by a predetermined number of revolutions of each of the drums 1' and 2, and, thus, provide a gap, after or before the cut, for the rolled strip 10.

Due to the obtained transmission ratio between the two drums 1, 2, in an acceleration phase of rotation of the two drums 1, 2, an increase of their speeds to that of the advancing speed of the rolled strip, before the cut step, up to their cut position became possible.

Though the present invention was shown and described with references to the preferred embodiments, such are merely illustrative of the present invention and are not to be construed as a limitation thereof and various modifications of the present invention will be apparent to those skilled in the art. It is there not intended that the present invention be limited to the disclosed embodiments or details thereof, and the present invention includes all variations and/or alternative embodiments within the spirit and scope of the present invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A high-speed shear for transverse cutting of a rolled strip comprising:
 - a first upper blade drum having a comparatively large diameter and carrying a first blade;
 - a second lower blade drum having a comparatively small diameter and carrying a second blade;
 - means for rotationally connecting the first and second blade drums, the first and second blades cooperating with each other in a predetermined cutting position of the first and second drums for cutting the rolled strip;
 - means located in front of and behind the first and second drums for advancing the rolled strip, under longitudinal tensioning, through a gap between the first and second drums; and
 - roller means for supporting the tensioned strip and providing for lifting of the strip before passing of the second blade and for lowering the strip before passing of the first blade through a cutting position.

2. A shear as set forth in claim 1, wherein the rotationally connecting means comprises two synchronizing tooth gears fixedly connected with respective blade drums and having different pitch circle diameters corresponding roughly to diameters of respective blade, the synchronization tooth gears engaging each other substantially backlash-free.

3. A shear as set forth in claim 1, wherein a portion of a periphery of the first upper blade drum opposite a blade carrying region is flattened.

4. A shear as set forth in claim 1, wherein the roller means cooperate with one of hydraulic, mechanical, driving and adjusting means an operation of which is synchronized with passing of a respective one of the second and first blades through the blade gap between the first and second drum.

5. A shear as set forth in claim 2, wherein the first and second blade drums are rotationally preloaded relative to each other.

6. A shear as set forth in claim 2, wherein in order to at least minimize the backlash, the tooth gear associated with the second lower blade drum is radially divided, with divided portions being rotationally preloaded with respect to each other.

7. A shear as set forth in claim 1, wherein a number of x-revolutions of one of the blade drums corresponds to a number of y-revolutions of another of blade drums so that the blade drums are brought into the cutting position after different but finite number of the x-revolution and y-revolutions of the respective blade drums.

8. A high-speed shear for transverse cutting a rolled strip to a length, comprising:

an upper beam bridge having a relatively large diameter and carrying a first blade and having a shaft stub on each of opposite longitudinal sides thereof;

a lower blade drum having a comparatively small diameter and carrying a second blade;

means for rotationally connect beam bridge with the lower drum, the first and second blades cooperating with each other in a predetermined cutting position of the beam bridge and the lower drum for cutting the rolled strip;

means located in front of and behind the beam bridge and the drum for advancing the rolled strip, under longitudinal tensioning, through a blade gap between the beam bridge and the lower drum; and

roller means for supporting the tensioned strip and providing for lifting of the strip before passing of the second blade and for lowering the strip before passing of the first blade through the blade gap.

9. A high-speed shear for transverse cutting a rolled strip to a length, comprising:

a first upper blade drum having a comparatively large diameter and carrying a cutting bit;

a second lower blade drum having a comparatively small diameter and carrying an anvil;

means for rotationally connecting the first and second drums, the cutting bit and the anvil cooperating with each other in a predetermined cutting position of the first and second drums for cutting the rolled strip;

means located in front of and behind the first and second drums for advancing the rolled strip, under longitudinal tensioning, through a blade gap between the first and second drums; and

roller means for supporting the tensioned strip and providing for lifting of the strip before passing of the second blade and for lowering the strip before passing of the first blade.

ABSTRACT OF THE DISCLOSURE

A high-speed shear for cutting a rolled strip to a length and including first upper and second lower blade drums carrying, respectively first and second blades and rotationally connected with each other, drive elements located in front of and behind the first and second drums for advancing the rolled strip, under longitudinal tensioning, through a blade gap between the first and second drums, and support rollers supporting the tensioned strip and providing for lifting of the strip before passing of the second blade and for lowering the strip before passing of the first blade through the blade gap.

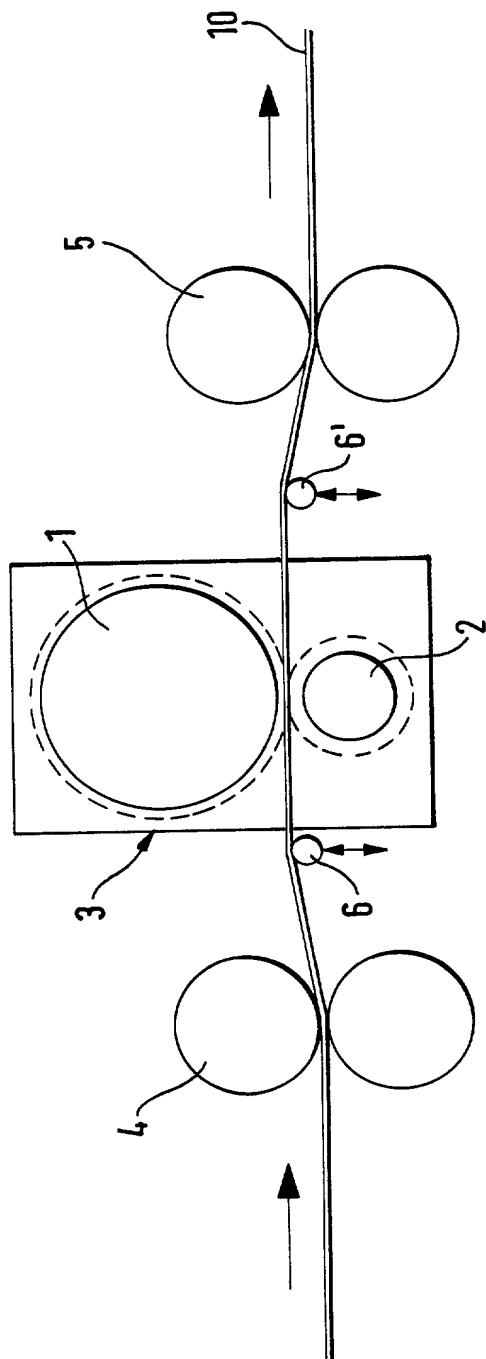


FIG.1

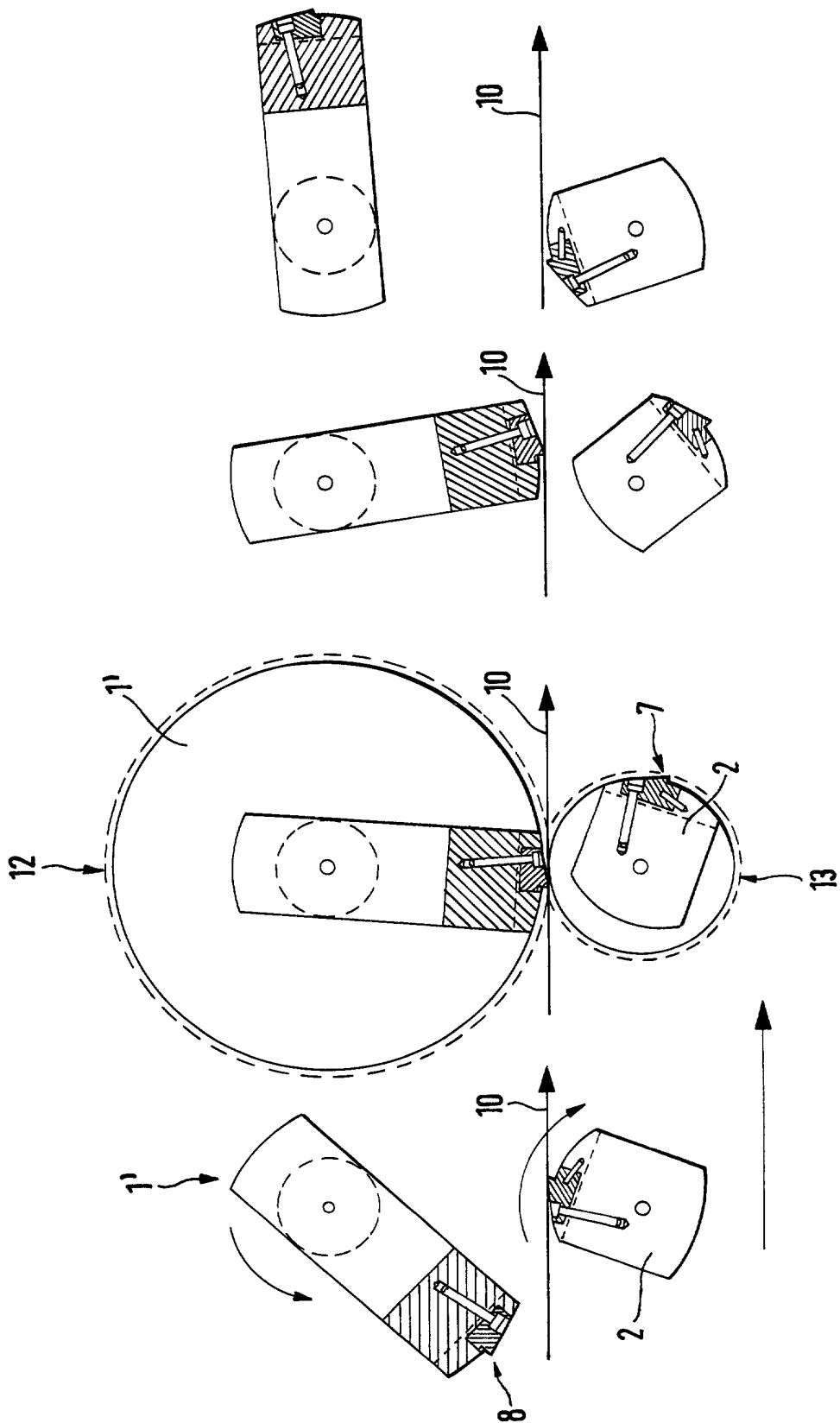


FIG.2

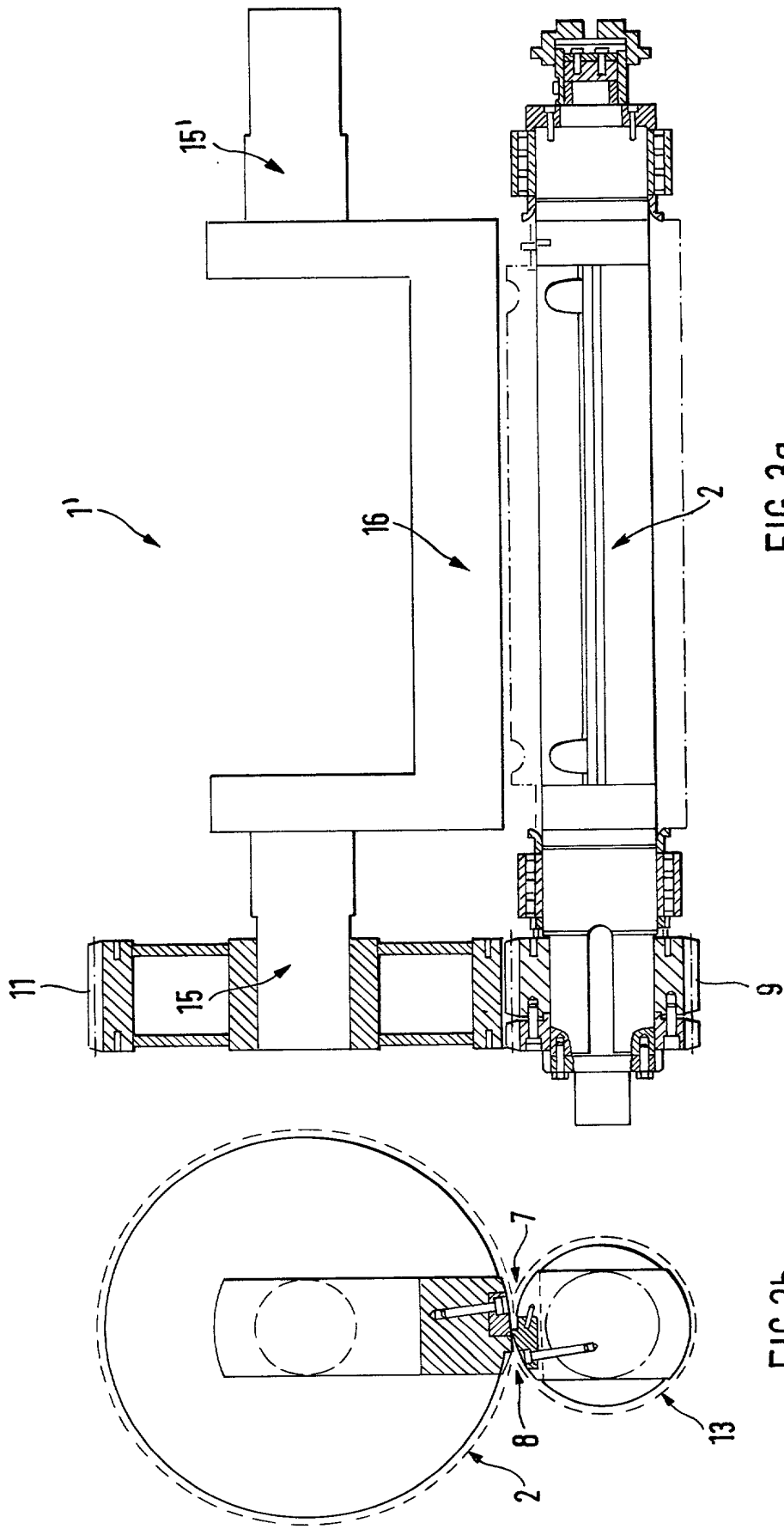


FIG. 3a

FIG. 3b

Declaration and Power of Attorney for Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

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deren Beschreibung
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☐ am _____ unter der
Anmeldungsnummer _____
eingereicht wurde und am _____
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Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

High-Speed Shear for Transverse Cutting of a Rolled Strip

the specification of which
(check one)

☒ is attached hereto

☐ was filed on _____
Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

German Language Declaration

Prior foreign applications
Priorität beansprucht

Priority Claimed

<u>199 53 908.1</u> (Number) (Nummer)	<u>Germany</u> (Country) (Land)	<u>10 November 1999</u> (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	<input checked="" type="checkbox"/> [x] Yes Ja	<input type="checkbox"/> [] No Nein
<u> </u> (Number) (Nummer)	<u> </u> (Country) (Land)	<u> </u> (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	<input type="checkbox"/> [] Yes Ja	<input type="checkbox"/> [] No Nein
<u> </u> (Number) (Nummer)	<u> </u> (Country) (Land)	<u> </u> (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	<input type="checkbox"/> [] Yes Ja	<input type="checkbox"/> [] No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 112 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

<u> </u> (Application Serial No.) (Anmeldeseriennummer)	<u> </u> (Filing Date) (Anmeldedatum)	<u> </u> (Status) (patentiert, anhängig, aufgegeben)	<u> </u> (Status) (patented, pending, abandoned)
<u> </u> (Application Serial No.) (Anmeldeseriennummer)	<u> </u> (Filing Date) (Anmeldedatum)	<u> </u> (Status) (patentiert, anhängig, aufgegeben)	<u> </u> (Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden können, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statement and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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David Toren
Alexander Zinchuk
Ronit Gillon
Paul Scott

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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Reg. No. 30,541
Reg. No. 39,202
Reg. No. 47,071

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Unterschrift des Erfinders

Datum

Inventor's Signature

Date

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Germany

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57271 Hilchenbach

Deutschland

Germany

Unterschrift des Erfinders

Datum

Inventor's Signature

Date

Voller Name des zweiten Miterfinders

Full name of the second joint inventor, if any

Jürgen Merz

Jürgen Merz

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57223 Krueztal

Deutschland

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Staatsangehörigkeit

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57223 Krueztal

Germany

Germany